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वस्त्रादि — कपड़ें की वायु के प्रति पारगम्यता ज्ञात करने की पद्धति

(पहला पुनरीक्षण)

Indian Standard

TEXTILES — DETERMINATION OF THE PERMEABILITY OF FABRICS TO AIR

(First Revision)

ICS 59.080.30

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

July 2013 **Price Group 3**

Physical Methods of Test Sectional Committee, TXD 01

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Physical Methods of Test Sectional Committee had been approved by the Textile Division Council.

Air permeability is an important features for fabrics used for special technical purposes such as parachutes, filter cloth, felts, impregnated fabrics, membranes, packing materials, etc.

This standard was first published in 1984 and has been revised to incorporate the technical details of the test apparatus and also the test conditions.

Considerable assistance has been derived from ISO 9237 : 1995 'Textiles — Determination of the permeability of fabrics to air' for the formulation of this Indian Standard. However this standard specify additional circular specimen holder of size 10 cm^2 which is not specified in ISO Standard.

Advice on checking the calibration and conducting the test and Suggested sampling procedure is given in Annex A and Annex B respectively for information only.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

TEXTILES — DETERMINATION OF THE PERMEABILITY OF FABRICS TO AIR

(First Revision)

1 SCOPE

This standard lays down a method for measuring the permeability of fabrics to air and is applicable to most types of fabrics, including industrial fabrics for technical purposes, non-wovens and made-up textile articles that are permeable to air.

2 REFERENCES

The standards given below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below:

IS No.	*Title*
3400 (Part 2) : 2003	Methods of test for vulcanized rubber: Part 2 Rubber, vulcanized or thermoplastic — Determination of hardness (Hardness between 10 IRHD and 100 IRHD) (*third revision*)
6359 : 1971	Method for conditioning of textiles
IS/ISO 10012 : 2003	Measurement management systems — Requirements for measurement processes and measuring equipment

3 DEFINITION

For the purpose of this standard the following definition shall apply.

3.1 Air Permeability — Velocity of an air flow passing perpendicularly through a test specimen under specified conditions of test area, pressure drop and time.

4 PRINCIPLE

The rate of flow of air passing perpendicularly through a given area of fabric is measured at a given pressure difference across the fabric test area over a given time period.

5 SAMPLING

Select samples either in accordance with the procedure laid down in the material specification for the fabric, or as agreed to between the interested parties.

In the absence of specification, follow the example of sampling given in Annex B.

6 ATMOSPHERES FOR CONDITIONING AND TESTING

The atmospheres for preconditioning, conditioning and testing shall be as specified in IS 6359.

7 APPARATUS

Metrological confirmation of the test apparatus shall be carried out in accordance with IS/ISO 10012.

7.1 Circular Specimen Holder, with an orifice allowing the test to be carried out on an area of 5 cm^2, 10 cm^2, 20 cm^2, 50 cm^2 or 100 cm^2.

The tolerance on the test area shall not exceed ± 0.5 percent.

NOTE — Adequate support of the test specimen, particularly for large test surfaces, is recommended.

7.2 Means for Clamping, to secure the specimen without distortion.

NOTE — Care should be taken to prevent leakage of air around the edges of the test specimen. Alternatively the leakage may be measured separately and subtracted from the test results.

7.3 Guard Ring Device, to prevent leakage for optional use in conjunction with clamping means (*see* **7.2** and **A-2.1**).

7.4 Pressure Gauge or Manometer, connected to the test head to indicate a pressure drop across the specimen test area of 50 Pa, 100 Pa, 200 Pa or 500 Pa, with an accuracy of at least 2 percent.

7.5 Means for Drawing a Steady Flow of Air at controlled temperature and humidity through the specimen holder and for adjusting the flow rate to produce a pressure drop across the specimen of between 50 Pa and 500 Pa.

7.6 Flow Meter, Volumetric Counter or Measuring **Aperture**, indicating the rate of air flow in dm^3/min (litre/min) with an accuracy of at least ± 2 percent.

NOTE — Flowmeters or volumetric counters measuring the rate of air flow in cm^3/s (or other suitable units) may be used, if the required accuracy of at least ± 2 percent is maintained.

8 CONDITIONING OF SAMPLES AND TEST CONDITIONS

Prior to test, the samples shall be conditioned and the test performed in the standard atmosphere for testing (*see* **6**).

Recommended conditions for the test are:

a) Test surface area : 20 cm^2;
b) Pressure drop : 100 Pa for apparel fabrics; and
c) Pressure drop : 200 Pa for industrial fabrics.

In cases where these pressure drops cannot be achieved or are not appropriate, an alternative pressure drop of 50 Pa or 500 Pa may be used and/or an alternative test area of 5 cm^2, 10 cm^2, 50 cm^2 or 100 cm^2 may be chosen, if agreed to between the interested parties.

NOTE — For comparison of results it is recommended to perform the test with the same test area and pressure drop.

9 TEST PROCEDURE

Mount the test specimen in the circular specimen holder (*see* **7.1**) with sufficient tension to eliminate wrinkles, if any, taking care that the fabric is not distorted in its own plane. Avoid selvedges and areas with creases or folded places. For fabrics for which the air permeability may be different between the two faces of the fabric, specify in the test report [*see* **11** (a) (2)] which face was tested. Clamp specimens coated on one side with the coating towards the lower pressure side to prevent air leakage.

Start the suction fan or other means (*see* **7.5**) to force the air through the test specimen and adjust the flow of air gradually till a pressure drop, as recommended above, is achieved across the test area of the fabric. Record the air flow (*see* **7.6**) after at least 1 min or until steady conditions are achieved.

Repeat the test at different locations on the sample at least 10 times under the same conditions.

NOTES

1 Advice on checking calibration and conducting the test is given in Annex A.

2 Some devices, for example volumetric counters, may need a volume of air flow of about 10 dm^3 to assure the required accuracy.

10 CALCULATION AND EXPRESSION OF RESULTS

10.1 Calculate the arithmetic mean of the individual readings and the coefficient of variation (to the nearest 0.l percent), stating the 95 percent confidence interval.

10.2 Calculate the air permeability, *R*, in mm/s, using the equation:

$$R = \frac{\overline{q}_v}{A} \quad 167$$

where

$\overline{q}_v$ = arithmetic mean flow rate of air, in dm^3 (litre/min);
A = area of fabric under test, in cm^2; and
167 = conversion factor from cubic decimetres (or litres) per minute per square centimetre to millimetres per second.

10.3 For open fabrics and non-wovens, the air permeability *R* may be expressed, in m/s using the equation:

$$R = \frac{\overline{q}_v}{A} \quad 0.167$$

where $\overline{q}_v$ and *A* are as defined in **10.2**.

10.4 Express the 95 percent confidence interval in the units specified in **10.2** or **10.3**, rounding the result *R* to 2 percent of the value obtained in **10.2** or **10.3.**

11 TEST REPORT

The test report shall include the following information:

a) *General information:*
  1) Number of this standard, that is IS 11056, and the date of test;
  2) All information necessary for complete identification of the sample tested and, if required, indication of the direction of air flow through the fabric;
  3) Test surface area used, in cm^2;
  4) Pressure drop used, in Pa;
  5) Number of specimens tested;
  6) Conditioning and testing atmospheres used; and
  7) Any deviation from the procedure specified.
b) *Test results*:
  1) Mean air permeability *R*, in mm/s or m/s, as applicable;
  2) Coefficient of variation, in percent; and
  3) 95 percent confidence interval, in mm/s or m/s, as applicable.

ANNEX A

(*Foreword* and *Clause* 9)

ADVICE ON CHECKING THE CALIBRATION AND CONDUCTING THE TEST

A-1 CHECKING THE APPARATUS AND CALIBRATION

It is advisable to check the calibration and the proper functioning of the apparatus weekly, if in constant use, prior to testing if used infrequently, and after the apparatus has been moved or repaired. The calibration of the apparatus should be checked periodically against a primary reference standard, at intervals of not greater than 12 months.

The calibration of the pressure gauge (*see* **7.4**) should also be checked periodically.

A calibration check plate with test aperture of known air permeability at given pressure drop should be used for checking the calibration. Ensure the reproducibility of the exact position of the check plate in the circular specimen holder (*see* **7.1**) to avoid any air leakage.

Means for checking the calibration recommended for specific types of apparatus should be used in accordance with the specification of the apparatus and the required accuracy of the test.

A-2 CONDUCTING THE TEST

A-2.1 Edge leakage may be prevented by means of an annular guard ring (*see* **7.3**). The pressure drop across the guard ring is measured by a separate pressure gauge or manometer (*see* **7.4**); the air drawn through the guard ring should not pass through the flow meter (*see* **7.6**). The pressure drops across the test and the guard ring surfaces are equalized, so that no air can pass edgewise either to or from the test surfaces.

If the measuring device is not equipped with a guard ring, the rate of edge leakage can be determined by covering the sample with a rubber plate of the same size as the sample. Rubber plates 1 mm to 2 mm thick, having a hardness of 65 IRHD to 70 IRHD when tested in accordance with IS 3400 (Part 2) have been found to be suitable.

A-2.2 Clamps on the fabric surface should be faced with a suitable grade of rubber (*see* **7.2**). Gaskets 2.5 mm thick and having a hardness of 65 IRHD to 70 IRHD when tested in accordance with IS 3400 (Part 2) have been found to be suitable.

A-2.3 Care should be taken when clamping the specimen to ensure that it is not distorted or stretched.

ANNEX B

(*Foreword* and *Clause* 5)

SUGGESTED SAMPLING PROCEDURE

B-1 PREPARATION OF BULK SAMPLE (NUMBER OF PIECES FROM A SHIPMENT OR LOT)

To prepare the bulk sample, take at random from the shipment or lot at least the appropriate number of pieces shown in Table 1. Ensure that no piece that shows signs of damage or dampness incurred during transit is included in the bulk sample.

B-2 PREPARATION OF LABORATORY SAMPLES

From each piece comprising the bulk sample, cut (from a position chosen at random but at least 3 m from an end of the piece) a laboratory sample of length at least 1 m and of full width. Ensure that areas that are creased or that have a visible fault are not included in a laboratory sample.

Table 1 Bulk Sample

(*Clause* B-1)

Sl No. (1)	Number of Pieces in Shipment or Lot (2)	Minimum Number of Pieces in Bulk Sample (3)
i)	3	1
ii)	4-10	2
iii)	11-30	3
iv)	31-75	4
v)	76	5

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Physical Methods of Test Sectional Committee, TXD 01

Organization	*Representative(s)*
Central Institute for Research on Cotton Technology (CIRCOT), Mumbai	Dr S. Sreenivasan (***Chairman***)
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Ashima Ltd, Ahmedabad	Shri Rashmikant H. Desai Shri Vipul S. Naik (*Alternate*)
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Shri J. K. Gupta
Scientist 'C' (TXD), BIS

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